WHAT IS CLAIMED IS:

1. A graft coated substrate, the substrate comprising polyethylene, and a graft coating covalently bonded thereto, wherein said graft coating comprises a non-polyethylene polymer or copolymer.

2. The graft coated substrate of claim 1, wherein the graft coating comprises a polymer selected from the group consisting of a urethane, an epoxy, a polysilicone, and combinations or copolymers thereof.

3. The graft coated substrate of claim 1 wherein the graft coating comprises materials selected from the group consisting of a pigment or colorant, a fire retarding agent, and combinations thereof.

4. The graft coated substrate of claim 1, wherein the substrate comprises a polyethylene having a density ranging from about 0.930 g cm^{-3} to about 0.940 g cm^{-3}.

5. The graft coated substrate of claim 1 that comprises a polyethylene having an average molecular weight ranging from about 100,000 amu to at least 6 x 10^6 amu.

6. The graft coated substrate of claim 1, wherein the substrate comprises a polyethylene selected from the group consisting of low density polyethylene, a linear low density polyethylene, a medium density polyethylene, a high density polyethylene, a high density, high molecular weight polyethylene, a high density, ultra high molecular weight polyethylene, an ultra-high density polyethylene, and combinations thereof.

7. The graft coated substrate of claim 1 that is formed into an article of manufacture selected from the group consisting of a pipe or tube, a curved or planar sheet, a beam, a board, a rod or shaft, a container for solids or fluids, and combinations thereof.

8. The graft coated substrate of claim 7 wherein the pipe is selected from the group consisting of straight pipe, bent pipe, a straight pipe joint, an elbow joint, an end-cap, a heat-shrinkable joint, and combinations thereof.

9. The graft coated substrate of claim 7 wherein the pipe is selected from the group consisting of single wall pipe, pipe with a plurality of walls nested one within the other, pipe with a single insulating layer between two concentric walls, and pipe with a plurality of concentric insulating layers.

10. The graft coated substrate of claim 1 that resists melting and burning for a time period ranging from about 1 to about 18 minutes, when the article is tested by exposure to a planar heated surface that is heated to a temperature ranging from about 800 to about 960°C,

and wherein the heating panel is a rectangle that measures about 25 x 51 cm, and the graft coated substrate is positioned at a distance of about 12.5 cm from the heating panel.

11. The graft coated substrate of claim 1 that has a surface energy ranging from about 56 to about 80 dynes/cm^2.

12. The graft coated substrate of claim 1 that has a surface energy of at least 80 dynes/cm^2.

13. A process for modifying the surface of a solid polyethylene substrate, comprising covalently grafting a heat resistant coating onto said substrate by

(a) applying to a solid polyethylene substrate, a liquid composition comprising effective amounts of a monomer, prepolymer, a graft initiator, a catalyst and a polymerization promoter, under conditions effective to promote grafting of the monomer or prepolymer to the solid polyethylene substrate to form a coating on the substate, and

(b) curing the applied composition.

14. The process of claim 13 wherein the monomer or prepolymer is selected from the group consisting of a vinyl monomer, a urethane monomer, an epoxy monomer, a silicon-based monomer and combinations thereof.

15. The process of claim 13 wherein the graft initiator is a metal ion, present in an amount effective to initiate radical formation in the polyethylene substrate.

16. The process of claim 15 wherein the graft initiator is present in a concentration ranging from about 0.01 to about 1.0%, by weight.

17. The process of claim 15 wherein the graft initiator is selected from the group consisting of ions of iron, silver, cobalt, copper, cerium and combinations thereof.

18. The process of claim 13 wherein the catalyst is a peroxide present in the liquid composition in a concentration ranging from about 0.1 to about 5% by weight.

19. The process of claim 13 wherein the catalyst is an selected from the group consisting of benzoyl peroxide, methyl ethyl ketone peroxide, 1-butyl hydroperoxide and combinations thereof.

20. The process of claim 13 wherein the polymerization promoter is present in a concentration effective to react with, and crosslink, the monomer or prepolymer.

21. The process of claim 20 wherein the polymerization promoter is a polyfunctional aziridine liquid crosslinker.

22. The process of claim 13 wherein the substrate is a polyethylene having a density ranging from about 0.930 g cm^{-3} to about 0.940 g cm^{-3}.

PART B

Crosslinker CX-100 1.8

23. The process of claim 13 wherein the liquid composition is applied to the substrate by a method selected from the group consisting of brushing, dipping, spraying and combinations thereof.

24. The process of claim 13 wherein the applied composition is self-curing.

25. The process of claim 13 wherein the applied composition is cured by heating the coated substrate at a temperature and for a duration sufficient to cure the applied coating.

26. The process of claim 25 wherein the applied composition is cured at a temperature ranging from about 60 to about 200 degrees F, for a time period ranging from about 30 minutes to about 6 days.

27. The process of claim 13 wherein the liquid composition further comprises a compatible flame retardant agent.

28. The process of claim 27 wherein the flame retardant agent is a phosphorous-based flame retardant.

29. The process of claim 27 wherein the flame retardant agent is selected from the group consisting of chlorinated phosphate esters, melamine derivatives, oligomeric phosphate esters, bromoaryl ether/phosphate product, and phosphonates.

30. The process of claim 27 wherein the flame retardant is selected from the group consisting of dimethyl methylphosphonate, diethyl-N, N-bis (2-hydroxyethyl) aminomethyl phosphonate, oligomeric chloroalkyl phosphate/phosphonate, tri (1, 3-dichloroisopropyl) phosphate, oligomeric phosphonate, tributyl phosphate, isopropylated triphenyl phosphate ester, and combinations thereof.

31. The process of claim 30 wherein the flame retardant agent is dimethyl methylphosphonate,

32. The process of claim 13 wherein the liquid composition is first prepared without the polymerization promoter, and the process further comprises the step of mixing the polymerization promoter with the liquid composition prior to application of the liquid composition to the substrate.

33. The process of claim 13 wherein the liquid composition further comprises a polymer selected from the group consisting of a vinyl polymer, a urethane, an epoxy, a polysilicone and combinations thereof, wherein said polymer is suitable for grafting to the substrate.

34. A solid polyethylene substrate comprising a graft coating covalently bonded thereto, prepared by the process of claim 13.

35. An article of manufacture comprising a graft coating covalently bonded thereto, prepared by the process of claim 13.

36. A liquid composition for graft coating a solid polyethylene substrate with a coating that comprises at least one non-polyethylene polymer, comprising an effective amount of a monomer or prepolymer, a graft initiator, a catalyst and a polymerization promoter.